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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,491	01/28/2004	Richard L. Guldi	TI 36326	3492

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EXAMINER	
LEE, CALVIN	
ART UNIT	**PAPER NUMBER**
2818	

DATE MAILED: 09/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/766,491	GULDI et al.	
	Examiner	Art Unit	
	Lee, Calvin	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *August 29, 2005 (Election)*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *15-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

OFFICE ACTION

Response to Election

1. The withdrawn of claims 15-20 in the Response to Restriction (without traverse), received on August 29, 2005 is acknowledged. Pending claims 1-14 are subjected for the rejections below.

Claims Objections

2. Claims 1-2, 4-6, 8-12 are objected to because of the following informalities:

Claim 1 lines 4 and 7, claim 2 line 3, claim 4 line 3, claim 5 line 3, claim 6 line 3, claim 9 line 2 (both materials), claim 10 line 2, claim 11 line 2 & claim 12 line 2, replace "material" with --seed-

Claim 4 line 2, claim 5 line 2, claim 6 line 2, and claim 8 line 2, replace "seed" with --barrier--

Claim Rejections - 35 U.S.C. § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 (e) that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language

4. Claims 1-7 and 10-13 are rejected under 35 U.S.C. 102(**e**) as anticipated by *Chikarmane et al* (US 2003/0034251).

a) In re claim 1, *Chikarmane et al* teaches an electroplating process, comprising the step of forming a thin layer **18** of oxide (i.e., CuO_2) on a seed layer **17** overlying a substrate **20** [Fig. 1d].

Since *Chikarmane et al* discloses the process (i.e., steps **210** thru **240)** "done in copper-barrier seed tool" [Fig. 2a], *Chikarmane et al* inherently teaches or suggest that the tool/enclosure

is substantially devoid of unwanted contaminants because the disclosed high vacuum chamber/enclosure **320** allows no airborne substances from entering into it [¶ 0033].

b) In re claim 2, *Chikarmane et al* discloses removing the substrate from the enclosure and placing the substrate in an electroplating solution [Fig. 2b].

c) In re claim 3, *Chikarmane et al* suggests the electroplating solution being a copper electroplating solution [¶ 0042].

d) In re claim 4, *Chikarmane et al* discloses forming a barrier layer **16** prior to forming a seed layer **17** [step **230** of Fig. 2a].

e) In re claim 5, *Chikarmane et al* suggest the enclosure including three compartments, wherein the barrier layer is formed in a first compartment **312**, the seed layer is formed in a second compartment **314**, and the thin layer of oxide is formed in a third compartment **316** [¶ 0046].

f) In re claim 6, although *Chikarmane et al* does not explicitly describe "said seed layer and said material layer are formed in a first compartment and said thin layer of oxide is formed in a second compartment," *Chikarmane et al* suggests "the cooper-barrier seed deposition tool **310** includes a plurality of chambers **312**, **314**, **316**, **318** that may be used for various phases of the process" [¶ 0046]. Therefore, *Chikarmane et al* inherently teaches or suggests the claim feature.

g) In re claim 7,*Chikarmane et al* suggests seed layer **17** being a copper seed layer [¶ 0027].

h) In re claim 10, *Chikarmane et al* discloses introducing pure oxygen into the enclosure, thereby forming the thin layer of cupric oxide [¶ 0031].

i) In re claim 11, *Chikarmane et al* suggests the thin layer of oxide having a thickness of about 5-100Å (equivalent to 0.5-10nm) [¶ 0031].

j) In re claim 12, *Chikarmane et al* also suggests [¶ 0031] forming the thin layer of oxide at a temperature of 15-20°C (within the claimed temperature ranging: -10°C to 150°C).

k) In re claim 13, as mentioned above, *Chikarmane et al* discloses the process (i.e., steps **210** thru **240)** "done in copper-barrier seed tool" [Fig. 2a]. Hence, *Chikarmane et al* inherently teaches that the enclosure is substantially devoid of unwanted contaminants because the disclosed high vacuum enclosure/chamber allows no airborne substances from entering into it [¶ 0033].

The Examiner notes that in *Chikarmane et al* [¶ 0035] "a contamination removal chamber **322**" supports the claimed "removing unwanted contaminants from the enclosure."

Claim Rejections - 35 U.S.C. § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Chikarmane et al*, as applied to claim 1, in view of *May et al* (US 2005/0064708).

Chikarmane et al is silent about formation pressures of barrier and seed layers. Nevertheless, such seed layer and barrier layer, and their formation pressures are known in the semiconductor processing art as evidenced by *May et al* disclosing a seed layer **202** formed at a low pressure of about 0.05 to 5mTorr [¶ 0036], and a barrier layer **306** formed at a pressure of about 0.5 to 5mTorr [¶ 0043].

It would have been obvious to one having skills in the art to have modified the formation of a seed layer and/or a barrier layer by utilizing low pressure(s) for the purpose of forming a seed and/or barrier layer having a uniform distribution of seed and/or barrier material [¶ 0042].

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Chikarmane et al* in view of *Lu et al* (US 2005/0031876).

Chikarmane et al teaches eliminating unwanted contaminants to promote void-free electroplating gap-fill but not suggesting such contaminants consisted of moisture, volatile organics, and ionic radicals. *Lu et al* describes common organic surface contaminants comprising moisture, volatile organics, and hydroxyl radicals [¶ 0004].

It would have been obvious to one having skills in the art to have modified the contaminants by utilizing moisture, volatile organics, and ionic radicals, suggested by *Lu et al*, for the purpose of clarifying those unwanted but common contaminants, which are well-known in the semiconductor etching/cleaning processing art.

Contact Information

7. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 on Mondays thru Thursdays 6:30-4:30 (EST). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2818's Supervisory Patent Examiner *David Nelms* can be reached at (571) 272-1787. The central fax number for the organization (where this application is assigned to) is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system at http:/pair-direct.uspto.gov. Should you have questions on access to the PAIR system, contact the Electronic Business Center at (866) 217-9197.

calvin lee

Calvin Lee